PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : A43B 13/40 // 13/20, 17/03 — A1

(11) International Publication Number: WO 94/23603

(43) International Publication Date: 27 October 1994 (27.10.94)

(21) International Application Number: PCT/DK94/00152

(22) International Filing Date: 15 April 1994 (15.04.94)

(30) Priority Data:
08/047,685 15 April 1993 (15.04.93) US

(71)(72) Applicant and Inventor: SCHOESLER, Henning, Raun [DK/DK]; c/o Familien Schoesler, Hoptrup Hovedgade 77, DK-6100 Haderslev (DK).

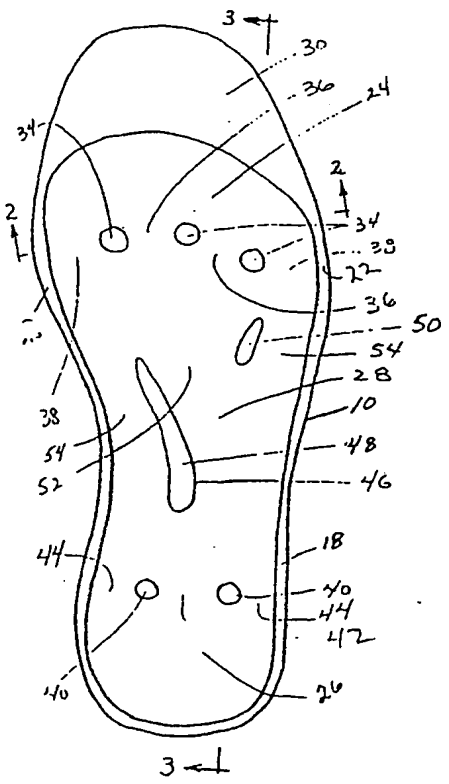
(81) Designated States: AU, CA, CH, JP, NO, NZ, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: FLUID FILLED INSOLE

(57) Abstract

A fluid filled insole comprises a fluid tight bladder having upper and lower layers and a generally foot-shaped planar configuration, with a metatarsal region, a heel region and arch region therebetween; a large-molecular, hygroscopic, sterile liquid substantially filling the bladder, the liquid comprising a mixture of polyvalent alcohol and distilled water; a plurality of spaced metatarsal flow deflectors joining the upper and lower layers in the metatarsal region of the bladder; a plurality of spaced heel flow deflectors joining the upper and lower layers in the heel region of the bladder; longitudinal flow passages between the metatarsal flow deflectors and heel flow deflectors; and a flow restrictor in the arch area of the bladder, whereby liquid flow from the heel area to the metatarsal area and vice versa and flow through the channels between flow deflectors spread the user's weight over a larger area reducing pressure on the plantar surfaces of the user's foot, provides massaging action to the plantar surfaces of the user's foot, improving venepump function and increasing blood circulation with its resulting medical benefits; ensures a liquid pillow on the medial and lateral sides of the user's foot to help against over pronation or over supination during walking; and beneficially stimulates zone therapeutic reflex zones.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgystan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo			SE	Sweden
CH	Switzerland	KR	Republic of Korea	SI	Slovenia
CI	Côte d'Ivoire	KZ	Kazakhstan	SK	Slovakia
CM	Cameroon	LI	Liechtenstein	SN	Senegal
CN	China	LK	Sri Lanka	TD	Chad
CS	Czechoslovakia	LU	Luxembourg	TG	Togo
CZ	Czech Republic	LV	Latvia	TJ	Tajikistan
DE	Germany	MC	Monaco	TT	Trinidad and Tobago
DK	Denmark	MD	Republic of Moldova	UA	Ukraine
ES	Spain	MG	Madagascar	US	United States of America
FI	Finland	ML	Mali	UZ	Uzbekistan
FR	France	MN	Mongolia	VN	Viet Nam
GA	Gabon				

FLUID FILLED INSOLE

Background of the Invention:

The present invention is directed to fluid filled podiatric insoles, and more particularly to insole bladders having fluid flow directing and restricting members within the bladder.

Fluid filled insoles have long been known in the art, see for example, U.S. Patent No. 4,567,677 to James Zona, U.S. Patent No. 4,115,934 to Hall and U.S. Design Patent No. D246,486 to John W. Nickel. Prior art insoles commonly comprise a bladder having an upper layer and a lower layer. The two layers are welded together at their marginal periphery. The bladder has a planar, foot-shaped configuration, which includes a metatarsal region, a heel region, and an arch region there between. The bladder is filled with a fluid, e.g., water, air, gel or a combination thereof. The benefits of fluid filled insoles are well known. These benefits include cushioning of the feet and massaging action on the plantar surface of the feet due to movement of the fluid within the bladder.

The fluid filled insoles of the prior art have not been entirely satisfactory, however, especially in the area of providing demonstrative medical benefits. Some prior insoles have little or no means for regulating the rate of fluid flow within the insole. As a user walks, the user's weight is initially applied to heel, and then is transferred to the ball of the foot. This causes the fluid within the bladder to move, respectively, from the heel region to the metatarsal region and then back towards the heel again. Without means for regulating fluid flow within the bladder, the fluid will rapidly surge or splash forward and back, adversely striking the plantar surface of the foot.

Some prior art devices, such as the insole of the Zona patent, have attempted to regulate flow from the heel region to metatarsal region and vice versa by placing flow restricting means in the arch area of the bladder. These flow restricting devices are only partly effective, however, as they do not regulate or direct the flow within the metatarsal or heel regions of the bladder. The location, direction, quantity and duration of fluid flow are important to achieve good massaging action on the foot, weight pressure distribution and directional stability.

Some prior art insoles, as shown for example in the Hall or Nickel patents have attempted to regulate fluid flow within the metatarsal and heel regions. But, these efforts have not been satisfactory because the fluid flow is directed to the outer, medial and lateral, margins of the insole, away from the areas of the foot where fluid massaging action is most needed.

Further, many prior art insoles are filled with ordinary water or other fluids that may develop bacteria or other microorganisms.

It would be desirable to have a fluid filled insole that maximizes desirable action to the plantar surface of the foot, controls liquid flow to minimize pressure on the foot, ensures directional stability during walking and which otherwise overcomes the limitations inherent in the prior art.

OBJECTS OF THE INVENTION:

It is an object of the invention to provide an insole that has superior massaging action to the plantar surface of the user's foot improving venous pump function and increasing blood circulation.

It is a further object of the invention to provide a fluid filled insole wherein the fluid flow is relatively flat, without undesirable surging or splashing.

It is another object of the invention to provide a liquid filled insole that effectively spreads the user's weight over a large area, reducing pressure on the plantar surfaces of the user's foot.

It is a fourth object of the invention to provide an insole filled with a sterile, non-toxic, non-greasy fluid that has low evaporation and diffusion rates.

It is a fifth object of the invention to provide a liquid filled insole that is durable and not prone to loose fluid by leakage, evaporation or diffusion.

SUMMARY OF THE INVENTION:

The insole of the invention comprises a fluid tight bladder having an upper layer of flexible material and a lower layer of flexible material sealingly joined together at their peripheral margins. The bladder has a generally foot shaped planar configuration, with a metatarsal region, a heel region, and an arch region there between. The bladder is filled with a large molecular, hygroscopic, sterile liquid, preferably a mixture of polyvalent alcohol and distilled water. Within the metatarsal region of the bladder is positioned a plurality of flow deflectors, preferably three, spaced transversely one from the other, and spaced from the medial and lateral margins of the bladder. The flow deflectors comprise weld points joining the upper and lower bladder layers. Substantially longitudinal flow channels are formed between the flow deflectors and between the flow deflectors and medial and lateral margins of the bladder. A plurality, preferably two, flow deflectors are located in the heel region of said bladder. One heel flow channel is formed between the heel flow deflectors. Thereby, fluid flowing from the heel region into the metatarsal region and vice versa will be channeled through the longitudinal flow channels in the metatarsal and heel regions in a controlled fashion, resulting in enhanced medical and therapeutic benefits as explained below.

The bladder is filled with a large molecular, hygroscopic, sterile liquid, preferably a mixture of polyvalent alcohol and distilled water. This mixture is sterile, non-toxic and resistant to contamination by bacteria or other microorganisms. Further, it has been found that the mixture of polyvalent alcohol and distilled water is not susceptible to evaporation or diffusion through the bladder layers. It is also autoclavable. In the event of a bladder puncture, the liquid may be easily removed from clothing and footwear, as the mixture is relatively non-greasy.

The insole of the invention has been tested and found to provide several desirable medical and therapeutic benefits. The insole distributes the user's weight over a larger area thereby reducing the pressure exerted on the plantar surface of the user's foot. The reduction in

pressure relieves stress on the bones of the foot that can cause foot pain, hard skin and in extreme situations, ulceration.

Second, the controlled flow of fluid through the bladder across the plantar surface of the user's foot during normal body movements provides a therapeutic massaging action. The massaging action improves venous pump function increasing blood circulation, which in turn improves transport of oxygen and nutrients to the cells in the foot and removal of waste products excreted from the cells. Improved blood circulation reduces the amounts of milk acid, thereby reducing the occurrence of myasthenia ("tired muscles").

Third, tests reveal that the specific locations of the flow deflectors aid in physiologically correct walking and running. Because of the channeling of the liquid in the longitudinal direction, liquid pillows are formed under the medial and lateral sides of the user's foot during walking. This in turn improves directional stability and helps problems involved in over supination and over pronation of asymmetric feet.

Finally, tests show that the specific circulation channels of fluids in the insole of the invention provides desirable zone therapeutic effects. Zone therapy is a healing art involving stimulating specific reflex zones on the foot, resulting in beneficial effects on various internal organs.

Other attributes and benefits of the present invention will become apparent from the following detailed specification when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS:

Fig. 1 is a plan view of a first preferred embodiment of the liquid insole of the invention.

Fig. 2 is a cross-sectional view of the first embodiment of the invention taken along line 2-2 of Fig. 1.

Fig. 3 is a cross sectional view of the first embodiment of the invention taken along line 3-3 of Fig. 1.

Fig. 4 is a plan view of a second embodiment of the invention.

Fig. 5 is a plan view of a third embodiment of the invention.

Fig. 6 is a plan view of the fourth embodiment of the invention.

Fig. 7 is a plan view of a fifth embodiment of the invention.

Fig. 8 is a plan view of a sixth embodiment of the invention.

Fig. 9 is a plan view of a seventh embodiment of the invention.

Fig. 10 is a cross-sectional view of the seventh embodiment of the invention taken along line 10-10 of Fig. 9.

DETAILED DESCRIPTION:

Turning now the drawings, Figs. 1 through 3, a first and preferred embodiment of the fluid filled insole of the invention is shown. The insole comprises a bladder 10 having an upper layer 12 and a lower layer 14. The insole preferably further includes a layer of velour material 16 substantially covering and laminated to the outer surface of upper bladder layer 14. The bladder layers 12 and 14 are sealing joined at their peripheral margins 18. For reference, the

inner or medial peripheral margin is numbered 20 and the outer or lateral peripheral margin is numbered 22. The bladder comprises three main regions, namely a metatarsal region 24, a heel region 26 and an arch region 28 there between. The insole of the invention also includes a toe region 30 formed by a forward extension of bladder layers 12 and 14.

The interior cavity 32 of the bladder 10 is filled with a sterile, non-toxic fluid. The fluid is preferably a mixture of large molecular, hygroscopic polyvalent alcohol (e.g. glycol) and distilled water, as is more fully described below. The fluid may freely flow between and throughout the metatarsal, arch, and heel regions. The toe region preferably does not contain fluid, because no significant part of the user's body weight rests on the toes.

Within the metatarsal region 28 of bladder 22 there are a plurality of transversely spaced flow deflectors 34. Preferably, there are three metatarsal flow deflectors 34, but, one could employ two, four or more metatarsal flow deflectors. The spacing between each of the flow deflectors and between the flow deflectors and the medial and lateral peripheral margins of the bladder is substantially equal distance, and the flow deflectors are arranged in an arch, the convex side of which faces in a distal direction. The flow deflectors 34 are formed by weld points joining the upper bladder layer 12 to the lower bladder layer 14. Formation of flow deflectors by welding points joining the bladder layers improves the structural integrity of the bladder, improving durability.

Between flow deflectors 34 are flow channels 36 through which fluid flows during use of the insole. Additional flow channels 38 are also formed in the metatarsal region between flow deflectors 34 and the medial peripheral margin 20, and between flow deflectors 34 and the lateral peripheral margin 22. The metatarsal flow channels 36 and 38 extend in a generally longitudinal direction. Flow deflectors 34 are shown as being circular, but other shapes may be alternatively used.

In the heel region 26 of bladder 10 there are a plurality of flow deflectors 40. Because the heel region is a smaller area than the metatarsal region, two flow deflectors are preferably used. Alternatively, three or more could be used. The heel flow deflectors 40 are formed in the same manner as the metatarsal flow deflectors, by a weld point joining the upper and lower bladder layers 12 and 14. At least one generally longitudinal flow channels 42 is formed between heel flow deflectors 40. Additional heel flow channels 44 are formed between heel deflectors 40 and the medical and lateral peripheral margins of the bladder.

In the arch region 28 of bladder 10 are flow restrictors 46. The arch flow restrictors may be configured in several different ways. Fig. 1 shows an elongated weld line 48 on the medial side of the bladder and a smaller weld point 50 on the lateral side of the arch region. A somewhat restricted, central flow channel 52 is formed there between. Side flow channels 54 are formed between the flow restrictors 46 and the peripheral margins 18 of bladder 10.

The second through sixth embodiments of the fluid filled insole of the invention, Figs. 4 through 8, are identical in all respects except that alternative flow restrictors in the arch region 28 of the bladder are employed. The second embodiment of the invention, illustrated in Fig. 4.

shows a flow restrictor comprising three weld points 56 joining the upper and lower bladder layers. Arch flow channels 58 are formed between the weld points.

Fig. 5 shows the third embodiment of the insole of the invention. The flow restrictor in the arch region comprises a multiplicity of weld points 60 arranged in a diagonal arc. Plural flow channels 62 are formed between the weld points.

Fig. 6 illustrates a fourth embodiment of the fluid filled insole of the invention. The fourth embodiment is characterized by a multiplicity of weld points 64 arranged in a straight, diagonal line, plus a lone weld point 66 spaced transversely from the others. Arch flow channels 68 are formed between the weld points.

Figures 7 and 8 illustrate, respectively, fifth and sixth embodiments of the fluid filled insole of the invention. The fifth embodiment has an arch flow restrictor comprising a single "C" shaped weld 70, between the upper and lower bladder layers, forming adjacent flow channel 72. The sixth embodiment has an arch flow restrictor comprising two "C" shaped welds 74 forming an interior flow channel 76.

Fig. 9 and 10 illustrate a seventh embodiment of the invention. The seventh embodiment is similar to the fifth embodiment, Fig. 7, except for the construction of the heel region, which comprises a shock absorbing foam material, as opposed to a liquid filled bladder. More specifically, the seventh embodiment comprises a bladder 10 having an upper layer 12 and a lower layer 14. A layer of velour material 16 is laminated to the outer surface of the upper layer 14. The bladder 10 has a liquid filled metatarsal region 24 and arch region 28. The metatarsal region 24 includes transversely spaced flow deflectors 34 and longitudinal flow channels 36 and 38 as described above. The arch region 28 includes a flow restrictor 70 and flow passage 72. The insole further comprises a heel region 26 and a toe region 30, but these latter two regions are not liquid filled. Rather toe region 30 is unfilled and heel region 26 is filled with shock absorbing foam cushion 78. A barrier wall 80 separates the liquid filled regions 24 and 28 from the heel region 26 and prevents liquid from flowing from the metatarsal and arch regions into the heel region.

The bladder is preferably fabricated from polyurethane sheet although polyvinyl chloride may also be used. The thickness of each bladder layer should be from about 600 to 800 micrometers, 600 micrometers being preferred. The velour material is preferably about 250 micrometers in thickness. The bladder may be formed by conventional friction welding techniques. Other welding techniques, such as thermal welding may be used alternatively. The bladder is filled with the liquid mixture leaving an opening in the peripheral weld, through which liquid may be introduced, then sealing the opening.

The insole of the invention may be made and sold as an insole for removable placement in shoes by the user. Also, the insole may be built into footwear as a permanent feature.

The fluid used to fill the cavity 32 of the bladder 10 is a mixture of distilled water and a sterile, non-toxic, large molecular, hygroscopic liquid to prevent evaporation or diffusion through the bladder. Polyvalent alcohols, such as glycerol are preferred. One suitable formulation comprises approximately 60-70% polyvalent alcohol and approximately 30-40% distilled

water. By using this mixture in lieu of plain water, improved benefits are achieved: The mixture of the invention as compared to water has a lower tendency to evaporate or diffuse through the bladder layers, thereby significantly improving life and durability of the insole. The liquid can withstand autoclaving as may be required by health care institutions. The insoles can be used in temperature ranges from minus 20 degrees Celsius to plus 120 degrees Celsius, because both the liquid mixture and bladder materials can withstand these temperature extremes. The liquid is fully sterile and non-toxic.

The sterility of the liquid is extremely important for several reasons. Children, people and animals could eat the insole, possibly drinking or swallowing the liquid. Water becomes septic after a few months of storage in some insoles, because bacteria will grow and flourish in the water.

Compared to water, the mixture of polyvalent alcohol and distilled water has a significantly higher density. This causes an improvement in the effects on the user's foot when wearing the insoles, because it helps to distribute the user's weight over a comparably larger area, and the slow movement of the vicious liquid will enhance the massage action.

The liquid is relatively non-greasy. Thus, if the insoles are punctured or for any reason the liquid runs out into the user's socks or shoes, the shoes and socks may be readily cleaned.

Testing has shown that there are four basic beneficial effects from wearing the insoles of the invention, namely: (1) reducing weight pressure on the foot; (2) stimulating blood circulation; (3) symmetric walking; and (4) zone therapeutic effect. Each of these therapeutic benefits will be explained in turn.

In the body, blood is pumped from the heart through the arteries out to the energy consuming muscles, where the blood carries the various energy substances such as carbohydrates and oxygen. Within the muscles, the energy is subsequently provided by an oxidation process in which carbohydrates interact with oxygen creating carbon dioxide, water and energy. If a person is working extremely hard--resulting in substantial use of muscles--the oxygen supplied to the muscles (through the blood supply) is insufficient to supply the muscles with sufficient energy. Energy may also be produced in the muscles by splitting of glycogen into milk acid and energy. Glycogen is a substance in the muscles. The oxygen-poor blood and cell waste products that have resulted from the energy production will then be transported through the veins back to the heart and the purifying organs of the body. The veins have a special venous pump system built-in that eases the transport of the blood back to the heart. The venous pump system functions in cooperation with the muscle activity since the moving muscle cause the veins to stretch and contract. Since the veins internally are equipped with venevalves (flaps) that prevent the blood from flowing away from the heart, the muscle activity on the veins causes the veins to function as a pump system that significantly increase blood transportation back to the heart.

When an individual is standing or walking for more than four hours per day, the foot muscles may receive insufficient movement and exercise. Individual movement of the many small muscles in the foot is hindered. If the foot muscles have insufficient strength, they do not have

the sustaining strength to maintain the weight of the body, and the heel bone and metatarsal bones may sink downwardly. The following chain reaction occurs:

1. When the feet collapse ("sink down"), the foot muscles are compressed, which reduces blood flow. Simultaneously, low muscle activity from the compression of the foot muscles causes a reduction of the venous pump function
2. The foot muscles do not receive sufficient oxygen and carbohydrate quantities for maintaining adequate energy production and oxidation.
3. Because of the constant pressure and lack of supply of oxygen and carbohydrates, the foot muscles start to produce energy by splitting of glycogen to milk acid and energy.
4. Because blood circulation is hindered, the process will accumulate milk acid in the foot muscles
5. Milk acid causes tiredness, heavy legs, and later pain, depending on the length of time walking or standing.
6. The tiredness feeling tends to cause people to place themselves in inappropriate or awkward positions in an effort to remedy the feeling, again affecting other muscles, leading to pain in legs, back, head, etc.

With the insole of the invention, the movement of the liquid within the bladder will result in the user's body weight being distributed over a larger area; thus relieving pressure on the foot muscles and avoiding the above chain reaction. Tests reveal that the insole of the invention reduces the average pressure in kilograms per square centimeter against the plantar surface of the user's foot. The improved spreading of the user's weight is particularly applicable during standing or walking. It is important to avoid a high pressure on heel and metatarsal bones, since such pressure can cause foot pain, hard skin, and, in extreme situations, ulceration. The weight of the user pressurizes the liquid within the bladder. The pressurized liquid will constantly move the non-loaded parts of the bladder upwards. Movement or weight shift by the user will cause fluid movement, whereby a constant movement of the small internal foot muscles occurs. Considerably improved venous pump function is thereby established in the foot itself. A constant massage of the foot sole occurs for each time weight distribution is changed.

When the feet, and thus the weight, is placed on the ground, a massaging action takes place between the feet and the insoles, stimulating the blood veins. The effect is a considerably improved venous pump function. Increased blood circulation is obviously very important for any person participating in a standing, walking or running activity. The function of the blood is to transport oxygen and nutrients to the cells, and return waste products to be excreted from the user's kidneys, through the urine. Improved blood circulation will decrease the amount of milk acid, an element known as causing myasthenia ("tired muscles"). Blood circulation is thus very important to individuals applying their muscles extensively, since muscle exertion constrains the blood corpuscles, thus hampering the transport of nutrients and waste

products. Another effect of insufficient blood supply is a reduction of the contraction ability of the muscles. The fluid filled insole of the invention enhances the location, amount and duration of beneficial massage action. A positive effect is a reduction and in many instances elimination of the painful effect of soreness in feet, legs, neck, head, and back caused by standing or walking for many hours a day.

The specific location of the flow deflectors in the metatarsal, heel and arch regions ensures correct circulation of liquid. This is important since uncontrolled liquid circulation would result in unstable walking and weight distribution. Directional stability in the liquid circulation ensures a flexible and symmetric walking, because the weight is resting on the foot's natural points. The function is similar to waterbeds. Obviously, the weight is the heaviest where one first places his foot on the ground, which is, logically, individual from person to person. The insole can help the problems involved in supination and pronation, i.e. where the user's feet are turning either to the inside or the outside ("asymmetric feet"). The combination of dispersing of weight pressure and controlled fluid circulation also supports a functionally correct take-off; a factor crucial for walking or running in an physiologically correct manner.

According to zone therapy, reflex zones appear under your feet, influencing various organs in your body. The therapy is performed by massaging the reflex zones. Examples of organs that are influenced are: kidneys, urinal system, sense organs, circulatory system, stomach, heart and metabolism. The insoles of the invention stimulate the reflex zones, and thus rectifies imbalances in vital functional areas of the body.

While the preferred embodiment of the present invention has been shown and described, it is to be understood that various modifications and changes could be made thereto without departing from the scope of the appended claims.

WHAT IS CLAIMED IS:

1. An improved insole of the type in which a bladder is filled with a fluid, said bladder having a generally foot shaped configuration with a metatarsal region, a heel region and an arch region there between, wherein the improvement comprises:
a plurality of substantially transversely spaced flow deflectors in the metatarsal region of said bladder, and at least one substantially longitudinal flow passage between said flow deflectors, whereby said fluid is deflected by said flow deflectors to flow through said channel.
2. An improved insole as in claim 1, wherein said plurality of flow deflectors comprises three substantially transversely spaced flow deflectors, and wherein two said flow channels are formed between said flow deflectors.
3. An improved insole as in claim 1, said bladder comprising an upper layer and lower layer, said layers being joined at their peripheral margins, wherein each of said flow deflectors comprises a weld point joining said upper bladder layer to said lower bladder layer.
4. An improved insole as in claim 1, further comprising second longitudinal flow channels between said flow deflectors and the medial and lateral margins, respectively, of said metatarsal region of said bladder.
5. An improved insole as in claim 1, wherein said flow deflectors comprises at least three flow deflectors, the spacing between each of said flow deflectors and between said flow deflectors and the medial and lateral peripheral margins of said bladder being substantially equal distance, and said flow deflectors being arrange in an arc, the convex side of said arc facing in a distal direction.
6. An improved insole as in claim 1, wherein said improvement further comprises a plurality of substantially transversely spaced heel flow deflectors in the heel region of said bladder, and at least one substantially longitudinal flow channel between said heel flow deflectors.
7. An improved insole as in claim 6, wherein the transverse spacing between said heel flow deflectors and the medial and lateral margins of said bladder are substantially equal distance.
8. An improved insole as in claim 6, said bladder comprising an upper layer and a lower layer joined at their peripheral margins, wherein each of said metatarsal flow deflectors and each of said heel flow deflectors comprise a weld point joining said upper and lower bladder layers.
9. An improved insole as in claim 1, further comprising flow restricting means in said bladder between said metatarsal and heel regions for restricting flow from said heel region to said metatarsal region and vice versa.
10. An improved insole as in claim 9, wherein said flow restricting means comprises at least one "C" shaped flow restriction in said arch region of said bladder.
11. An improved insole as in claim 9, said bladder comprising an upper layer and a lower layer joined at their marginal edges, wherein said flow restriction means comprises a plurality of spaced arch weld points joining said upper layer to said lower layer in said arch region of said bladder, and a plurality of arch fluid flow channels between said arch weld points.

12. An improved insole as in claim 1, wherein said bladder comprises an upper layer and a lower layer joined at their peripheral margins, further comprising a layer of velour material laminated to and substantially covering the outer surface of said upper layer.

13. An improved insole as in claim 1, wherein said fluid comprises a sterile liquid.

14. An improved insole as in claim 1, wherein said fluid comprises a large molecular, hygroscopic, sterile liquid.

15. An improved insole as in claim 1, wherein said fluid comprises 60 to 70 percent by weight of large molecular, hygroscopic, polyvalent alcohol and 30 to 40 percent by weight distilled water.

16. An improved insole as in claim 1 wherein said bladder comprises an upper layer and a lower layer of polyurethane film, each said bladder layer being of about 600 to about 800 micrometer thickness, said bladder layers being welded to each other at their peripheral margins.

17. An improved insole as in claim 1, wherein said insole is incorporated into footwear.

18. An improved insole as in claim 1, further comprising a pad of shock absorbing foam material in said heel region of said bladder.

19. An insole, comprising

a lower layer of substantially impermeable, flexible material; an upper layer of substantially impermeable, flexible material; said upper and lower layers being sealing joined to one another at their peripheral margins, said upper and lower layers forming a substantially fluid tight bladder, said bladder having a generally planar, foot-shaped configuration having a metatarsal region, a heel region and an arch region there between;

a plurality of substantially transversely spaced metatarsal flow deflectors between said upper material layer and said lower material layer in said metatarsal region;

at least one substantially longitudinal metatarsal flow channel between said metatarsal flow deflectors;

a plurality of substantially transversely spaced heel flow deflectors between said upper material layer and said lower material layer in said heel region;

at least one substantially longitudinal heel flow channel between said heel flow deflectors; and

a large molecular, hygroscopic, sterile fluid within said bladder and flowable from said heel region to said metatarsal region and vice versa and flowable through said metatarsal channel and said heel channel

20. An insole as in claim 19, further comprising flow restricting means between said upper material layer and said lower material layer for restricting the rate of flow of fluid from said heel region to said metatarsal region and vice versa.

21. An insole as in claim 19 further comprising a layer of velour material laminated to and substantially covering said outer surface of said upper layer of flexible material.

22. An insole, comprising

a substantially fluid tight bladder, said bladder comprising an upper layer and a lower layer sealing joined at their peripheral margins, said bladder having a generally foot shaped planar configuration with a metatarsal region, a heel region and an arch region there between;

a sterile liquid substantially filling said bladder, said liquid comprising about 60 to 70 percent large molecular, hygroscopic alcohol and about 30 to 40 percent distilled water;

a plurality of substantially transversely spaced metatarsal weld points joining said upper and lower bladder layers in said metatarsal region of said bladder;

a plurality of substantially longitudinal, metatarsal flow channels in said metatarsal region between said metatarsal weld points, between said metatarsal weld points and the medial margin of said metatarsal region of said bladder and between said metatarsal weld points and the lateral margin of said metatarsal region of said bladder, said sterile liquid being flowable through each of said longitudinal metatarsal flow channels;

a plurality of substantially transversely spaced heel weld points joining said upper and said lower bladder layers in said heel region of said bladder;

a plurality of substantially longitudinal heel flow channels in said heel region of said bladder between said heel weld points, between said heel weld points and the medial margin of said bladder and between said heel weld points and the lateral margin of said bladder;

a plurality of arch weld points joining said upper layer to said lower layer in said a arch region of said bladder, said arch weld points restricting the rate of flow of said sterile liquid from said heel region to said metatarsal region and vice versa, forming a liquid pillow to support the user's arch; and

a layer of velour material laminated to and substantially covering the outer surface of said upper layer of said bladder

23. An insole, comprising

a substantially fluid tight bladder, said bladder comprising an upper layer and a lower layer sealing joined at their peripheral margins, said bladder having a generally foot shaped planar configuration with a metatarsal region, an arch region, and a heel region;

a fluid substantially filling said metatarsal and arch regions of said bladder, said liquid comprising a large molecular, hygroscopic, sterile liquid;

a plurality of substantially transversely spaced metatarsal flow deflectors between said upper and lower bladder layers in said metatarsal region of said bladder;

a plurality of substantially longitudinal, metatarsal flow channels in said metatarsal region between said metatarsal flow deflectors, between said metatarsal flow deflectors and the medial margin of said metatarsal region of said bladder and between said metatarsal flow

deflectors and the lateral margin of said metatarsal region of said bladder, said fluid being flowable through each of said longitudinal metatarsal flow channels

flow restricting means in said arch area of said bladder for restricting the rate of flow of said fluid into and out of said metatarsal region;

barrier means in said bladder for preventing flow of said fluid from said metatarsal and arch regions into said heel region; and

shock absorbing foam sandwiched between said upper and lower bladder layers in said heel region

24. An improved insole as in claim 23, further comprising a layer of velour material laminated to and substantially covering the outer surface of said upper layer of said bladder.

Fig.1

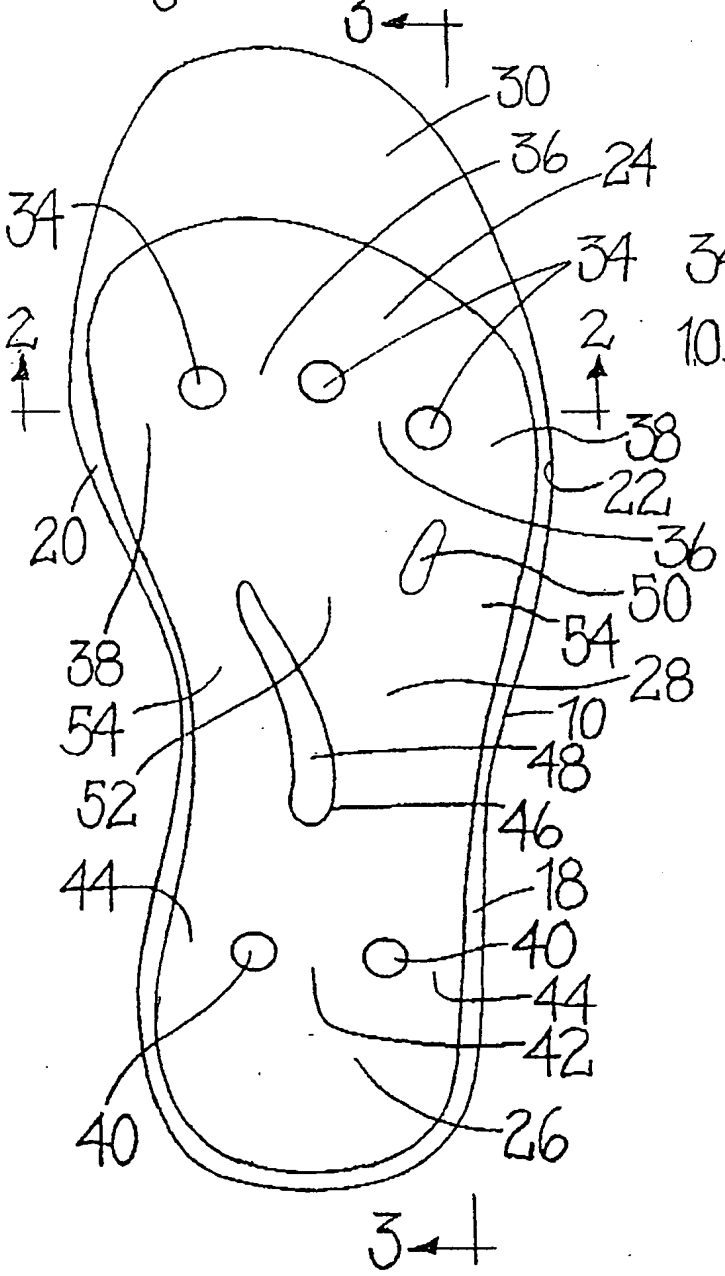


Fig.4

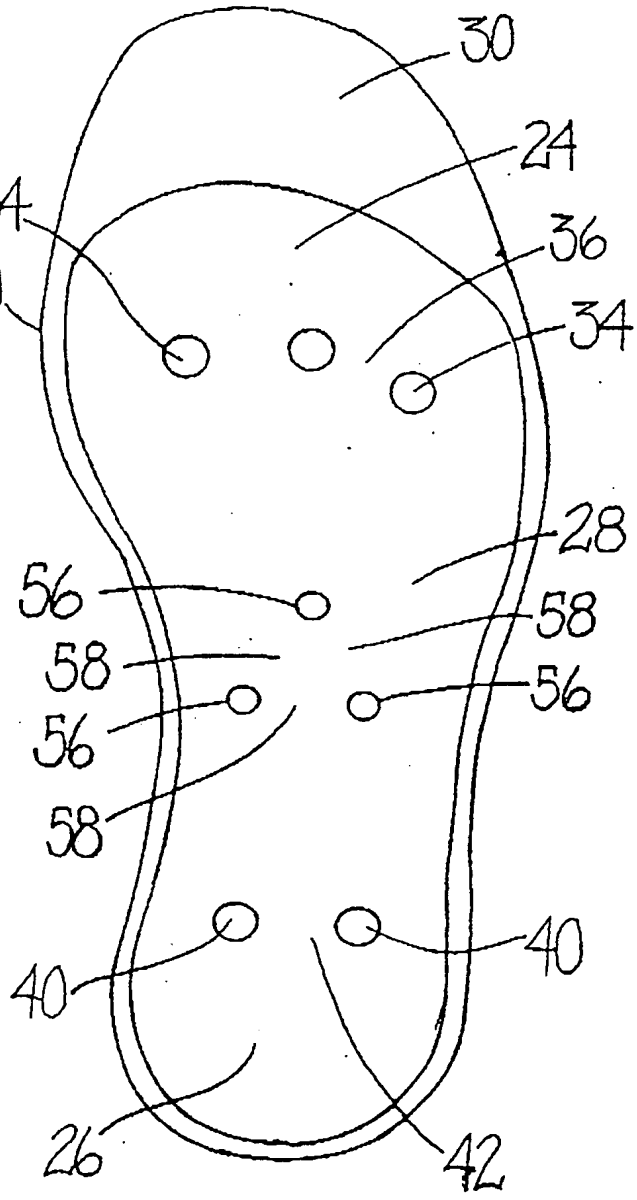


Fig.2

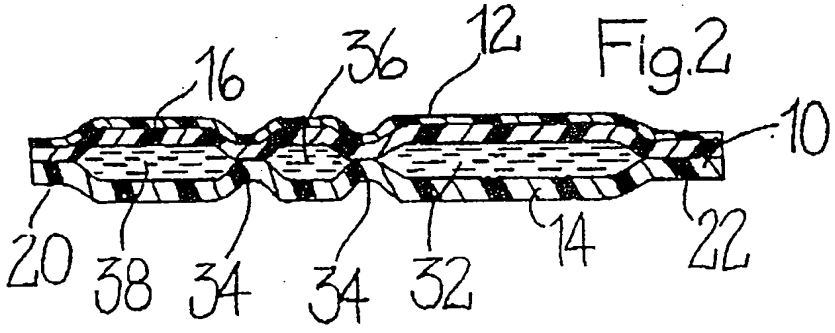


Fig.5

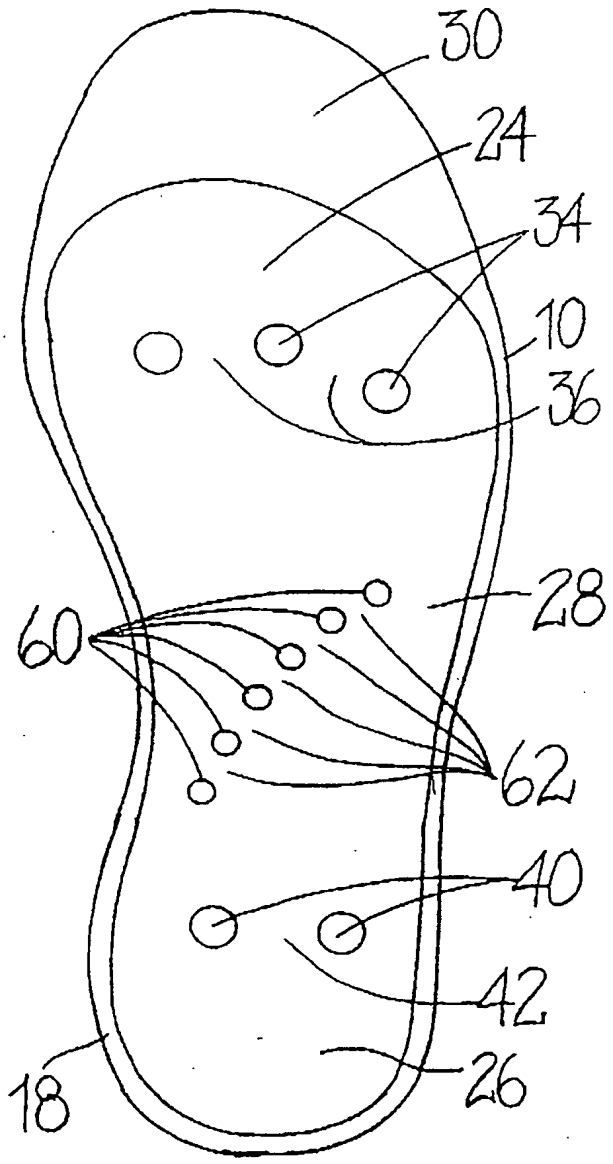


Fig.6

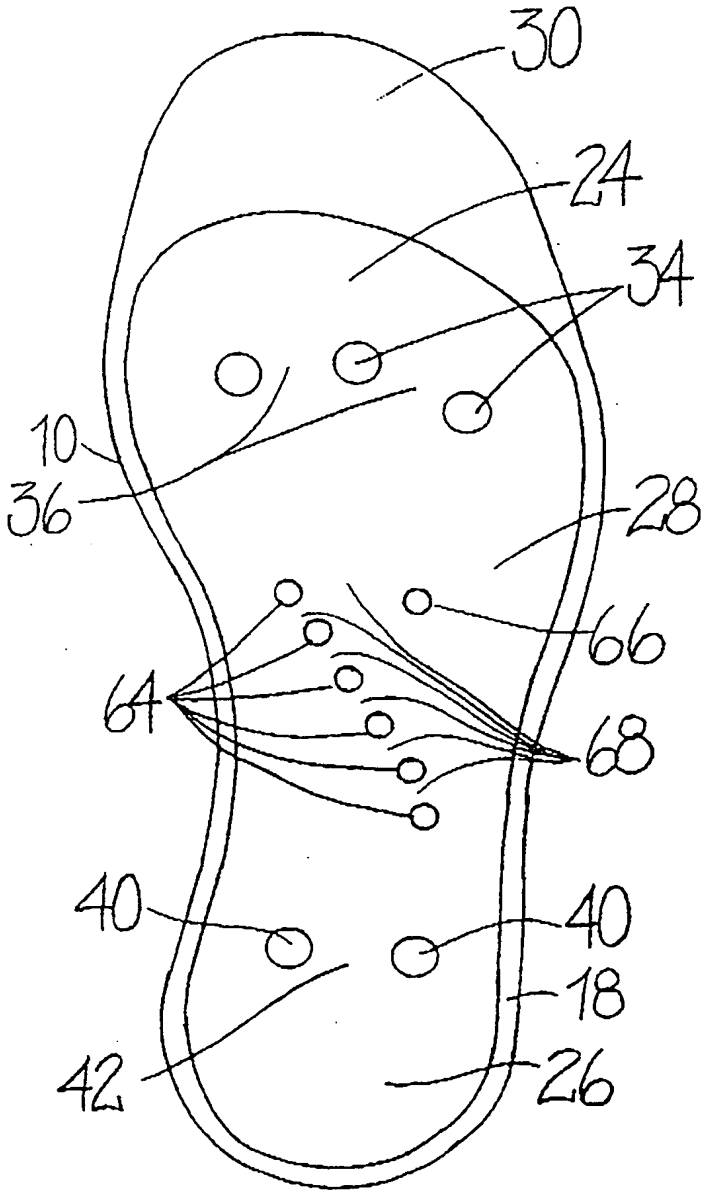


Fig.3

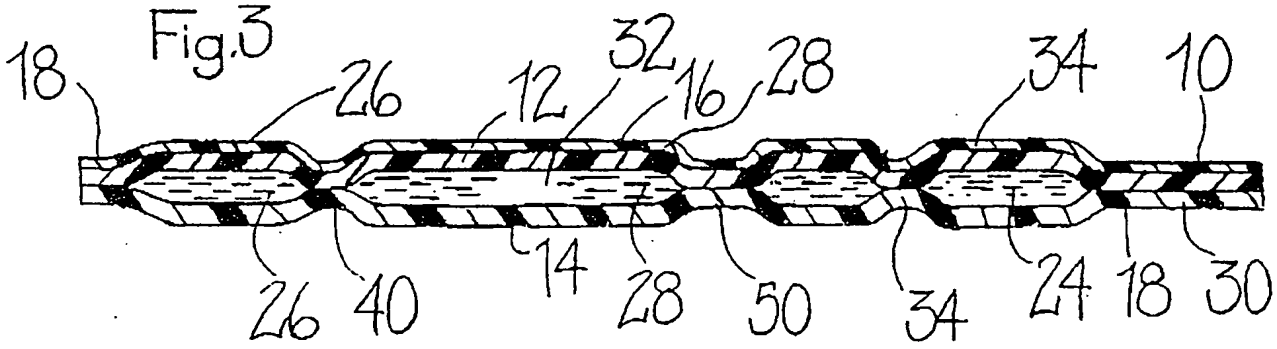


Fig.7

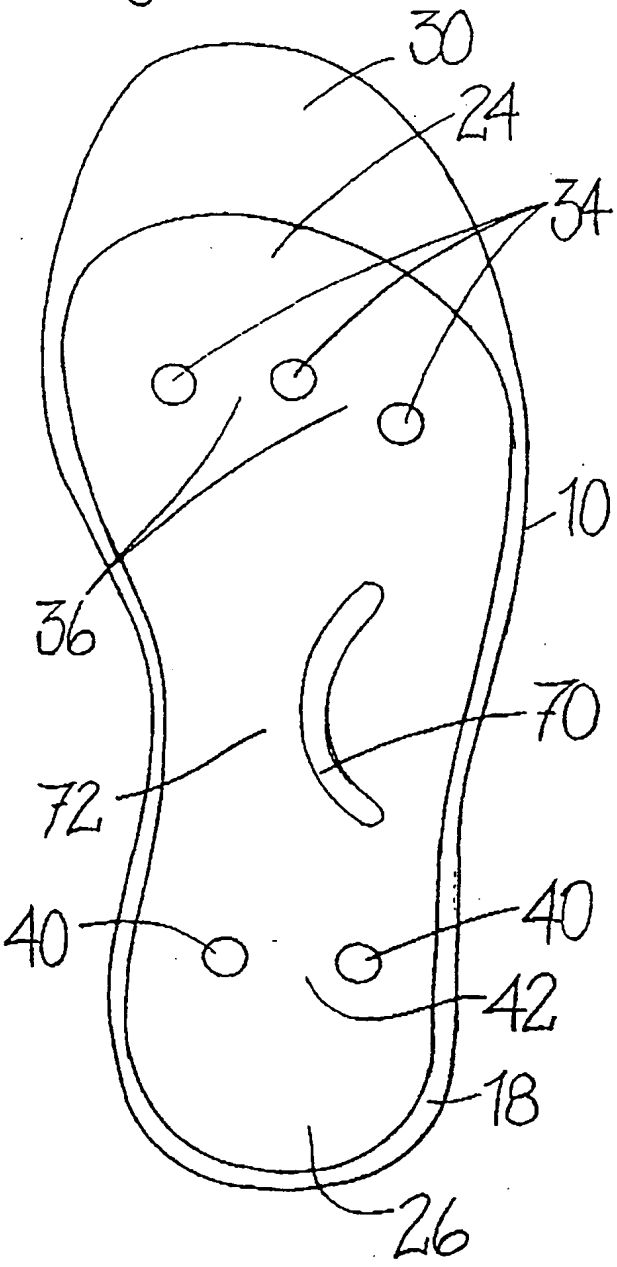


Fig.8

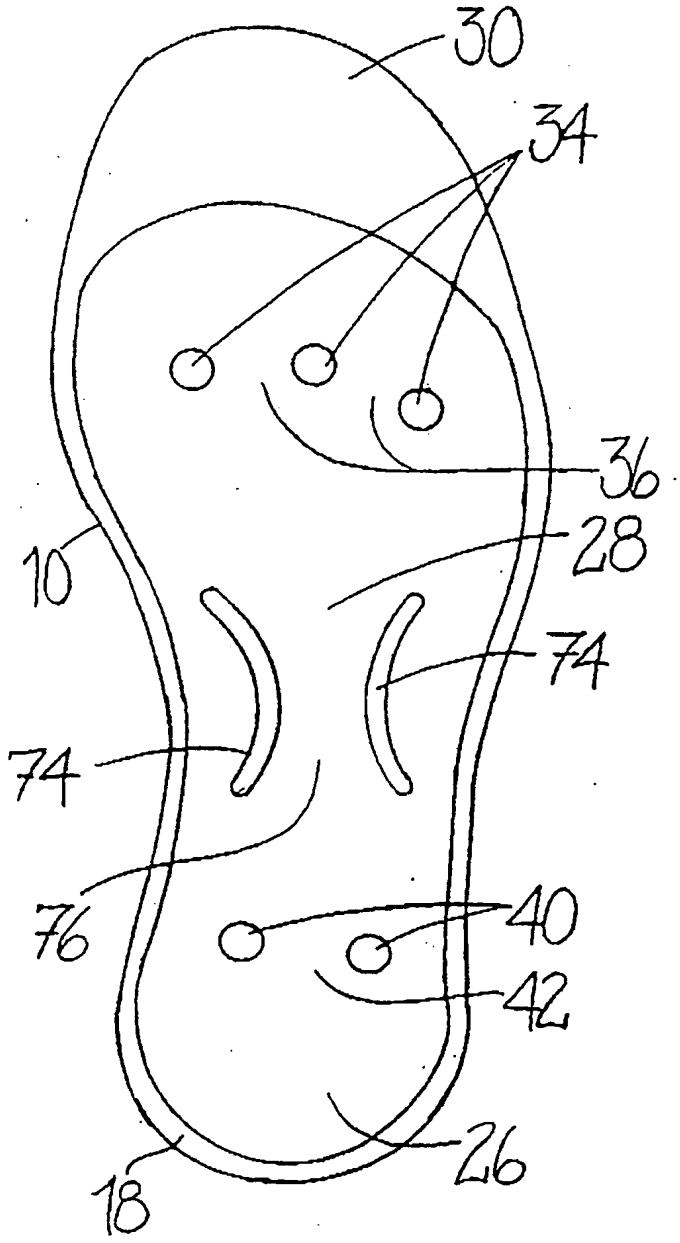


Fig.9

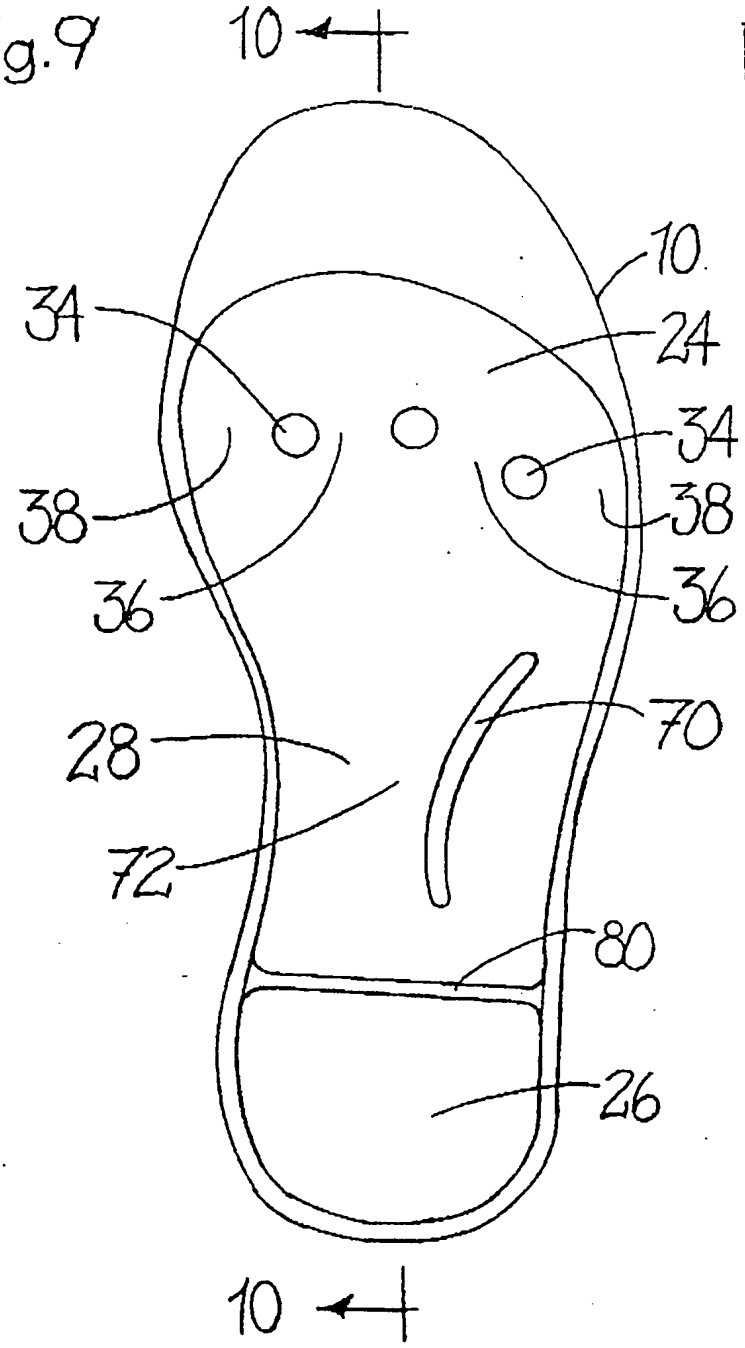
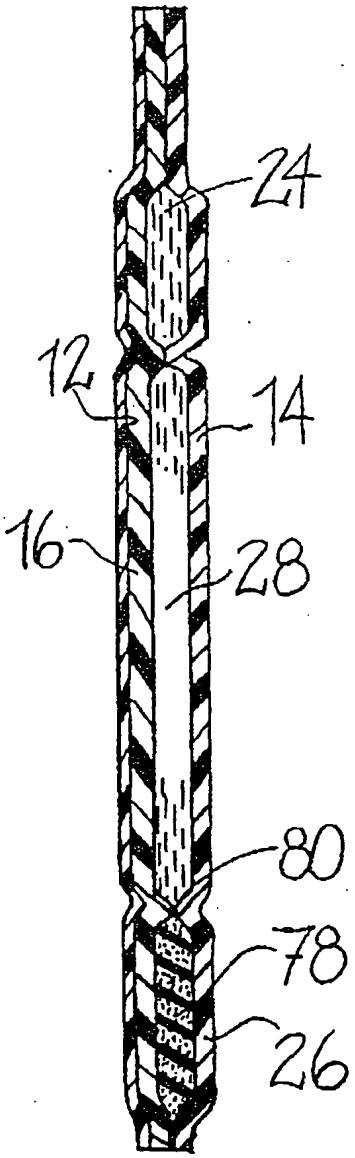


Fig.10



INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 94/00152

A. CLASSIFICATION OF SUBJECT MATTER

IPC 5 : A43B 13/40 // A43B 13/20; A43B 17/03
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 5 : A43B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 4123855 (THEDFORD), 7 November 1978 (07.11.78), column 2, line 52 - column 3, line 13, figure 1 --	1-3
X	US, A, 4567677 (ZONA), 4 February 1986 (04.02.86), column 2, line 25 - line 39, figures 1,2 -- --------	1-3

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 July 1994	28 -07- 1994
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Sune Söderling Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/07/94

International application No.
PCT/DK 94/00152

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4123855	07/11/78	NONE	
US-A- 4567677	04/02/86	NONE	